

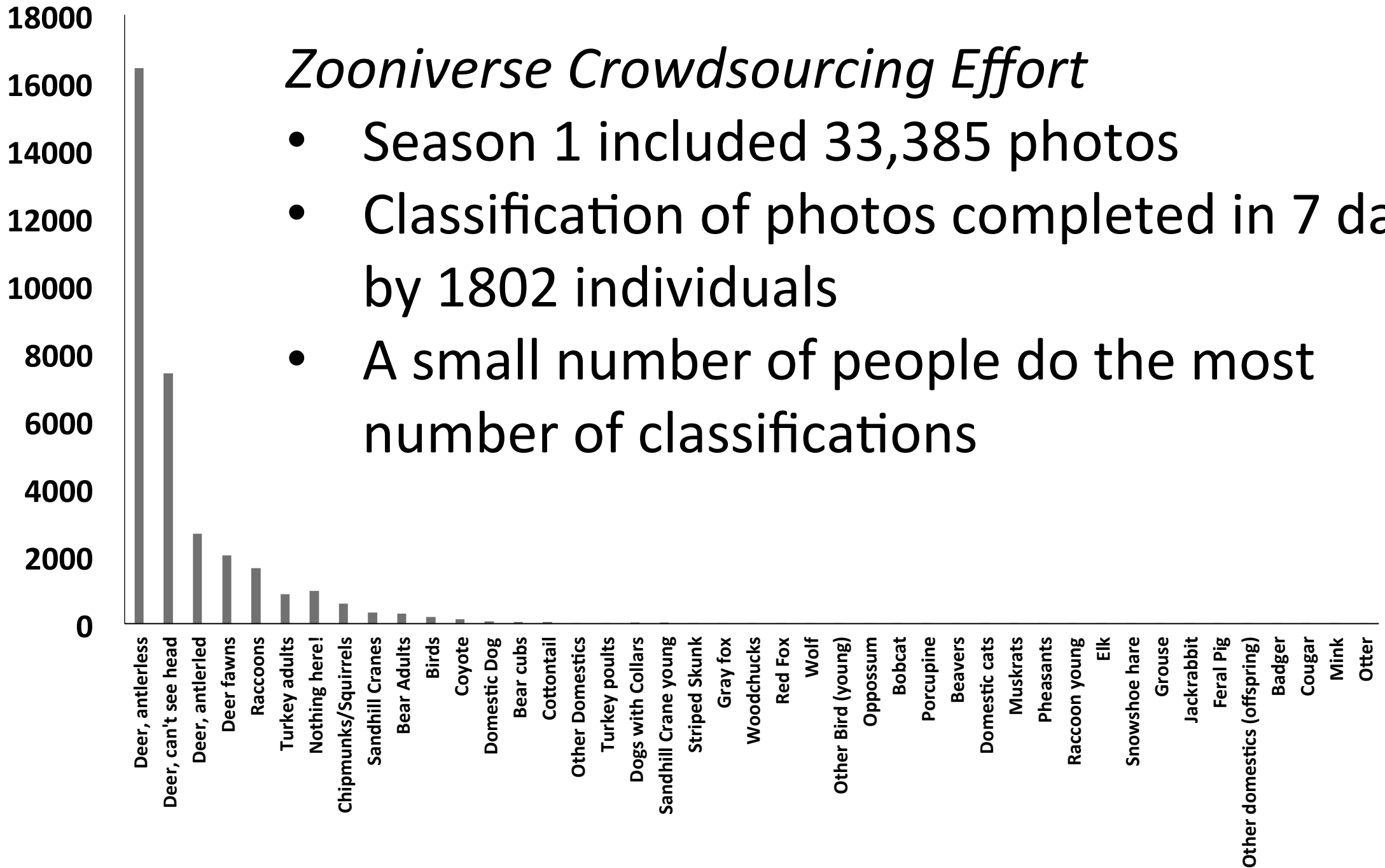


SNAPSHOT
W I S C O N S I N



Can we predict animal presence and abundance statewide using remote sensing and trail cameras?

- Partner Agency
- Citizen Science / Crowdsourcing
- Remote Sensing
- Predictive Modeling
- Resource Management Objective
- Application Implementation



Modeling Animals as a Function of Remote Sensing

ψ Probability of occurrence

p Probability of detection

λ Expected abundance

John Clare (Ph.D. Student), Ben Zuckerberg, Tim van Deelen, Phil Townsend, *UW-Madison*
Jen Stenglein, *Wisconsin DNR*

Occurrence/Distribution

$$z_i \sim \text{Bernoulli}(\psi_i)$$

A site is occupied w/ some probability

$$\text{Logit}(\psi_i) = \beta_0 + \beta_1 X_i$$

This probability changes with environmental conditions

$$\text{Logit}(p_{ij}) = \beta_0 + \beta_1 X_{ij}$$

If occupied, we observe the species with some probability that may vary over time or space

$$y_{ij} \sim \text{Bernoulli}(p_{ij} \times z_i)$$

Our repeated presence-absence observations reflect the product of these distinct probabilities

Abundance

$$N_i \sim \text{Poisson}(\lambda_i)$$

Abundance at a site is a realization from an expected mean

$$\text{Log}(\lambda_i) = \beta_0 + \beta_1 X_i$$

Expected abundance varies across space

$$\text{Logit}(r_{ij}) = \beta_0 + \beta_1 X_{ij}$$

Each individual animal has some probability of being observed that may vary over time of space

$$p_{ij} = 1 - (1 - r_{ij})^{N_i}$$

The probability of observing the species at a specific time is proportional to individual detection and the number of individuals

$$y_{ij} \sim \text{Bernoulli}(p_{ij})$$

Repeated presence-absence reflects abundance and individual detection

Ongoing Work

Incorporate additional uncertainty

- MODIS Land Cover Dynamics
- Additional Landscape Metrics

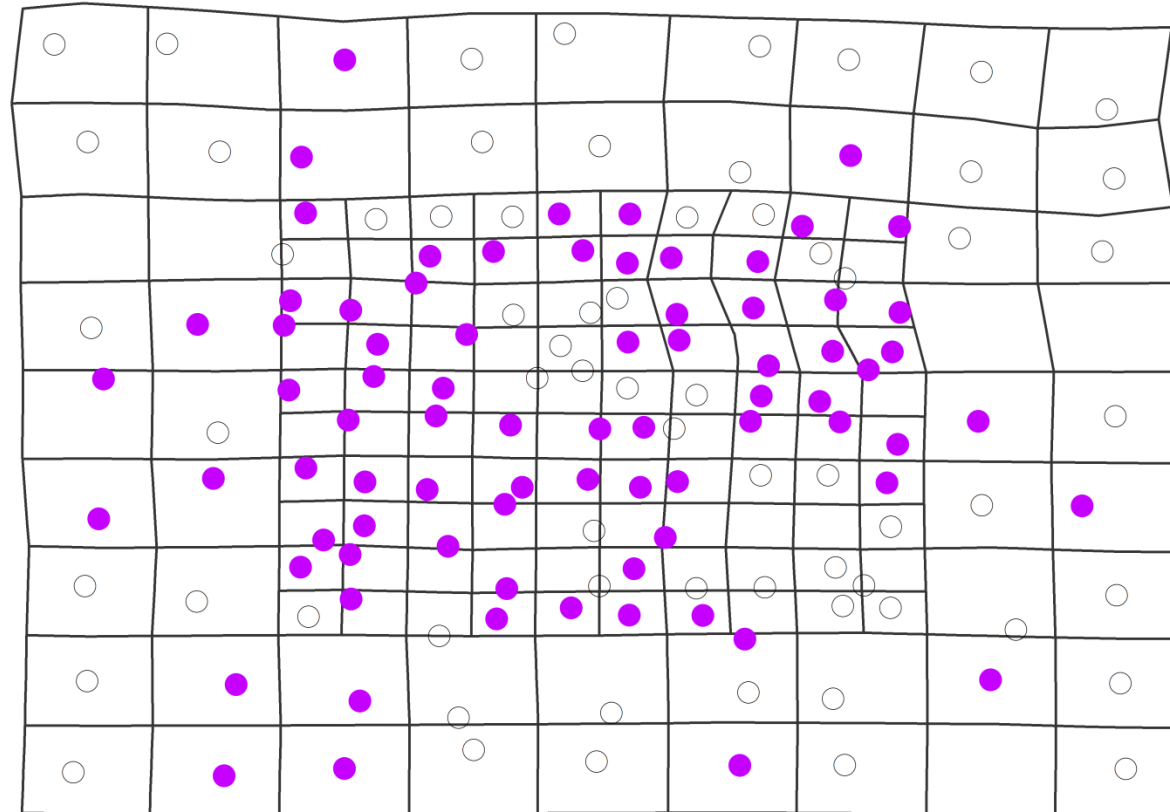
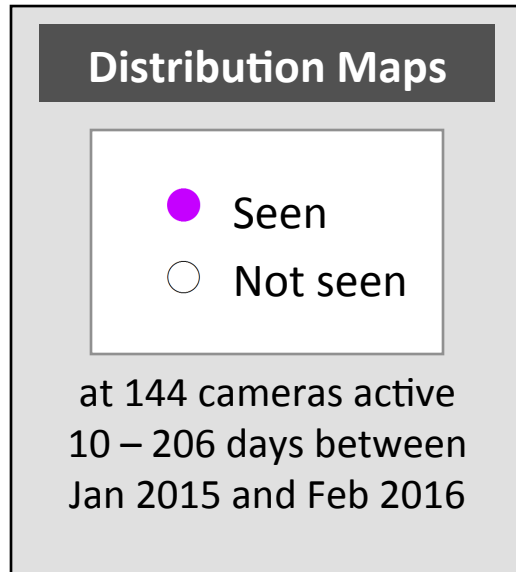
Incorporate dynamics

Explicitly consider spatial demographic processes

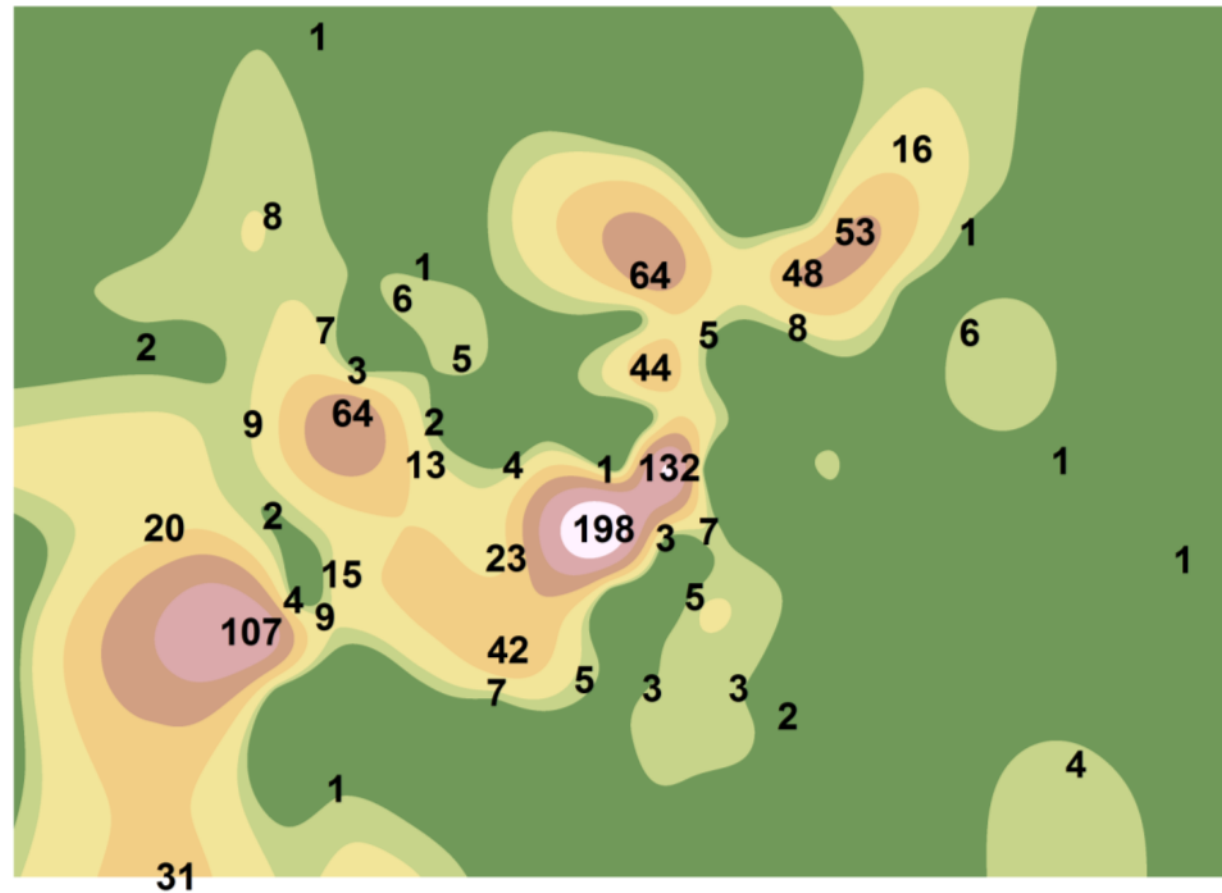
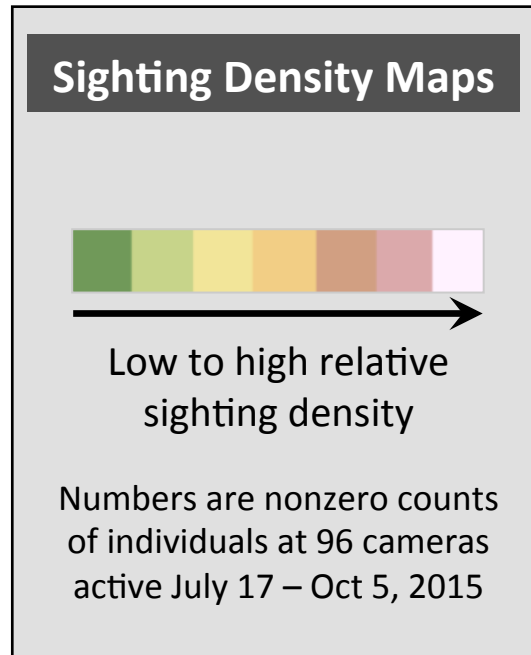
Application by Wisconsin DNR

Social Science

Camera sites with elk

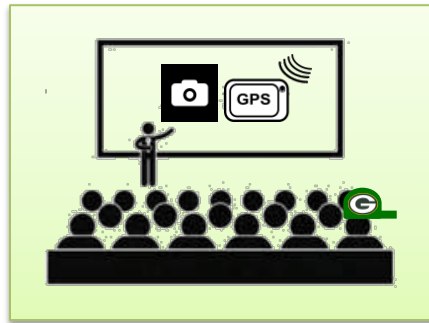


Sighting density of elk



Citizen Science: Two ways to participate

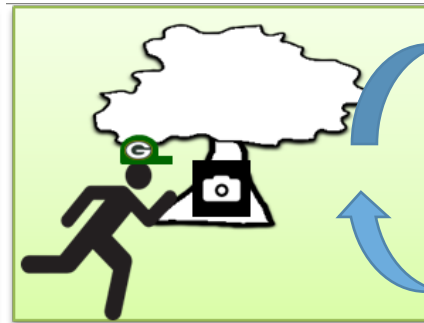
1. Host a trail camera within a survey block



Attend training



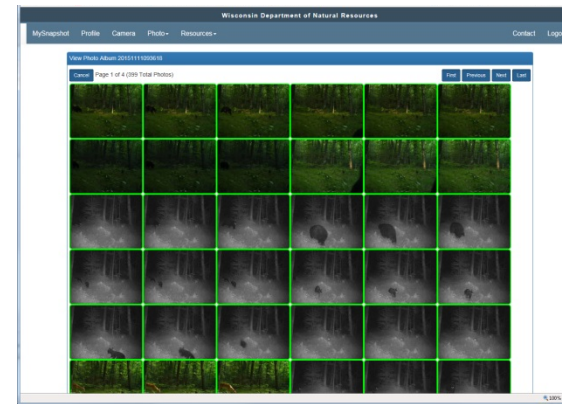
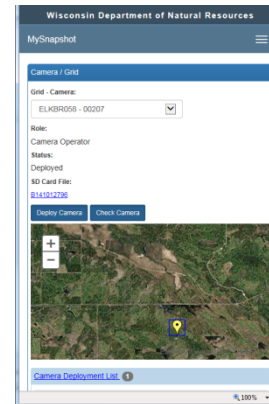
Set up a camera



Retrieve photos

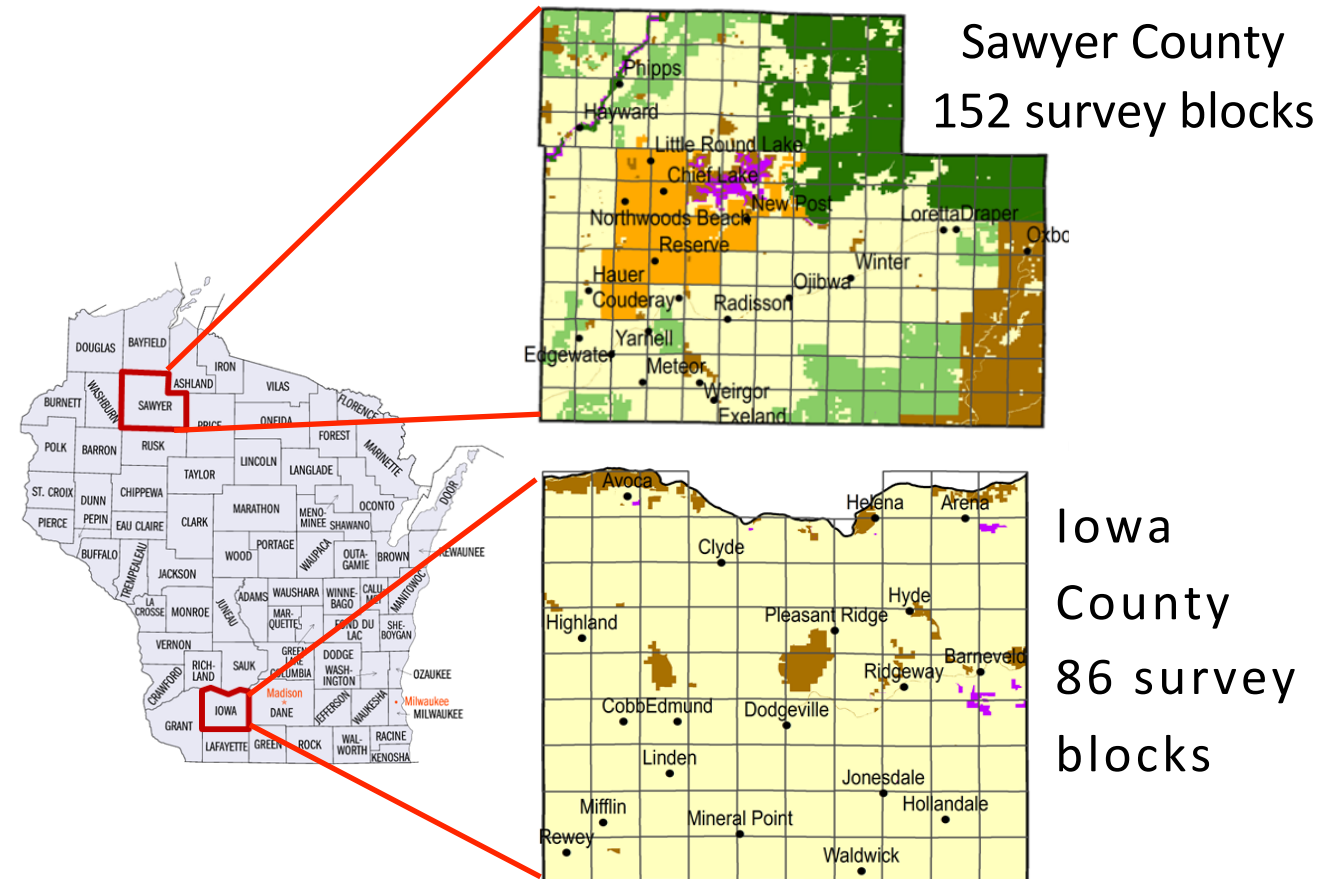
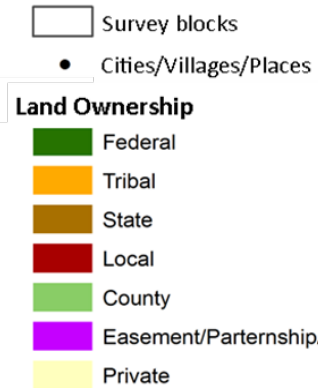
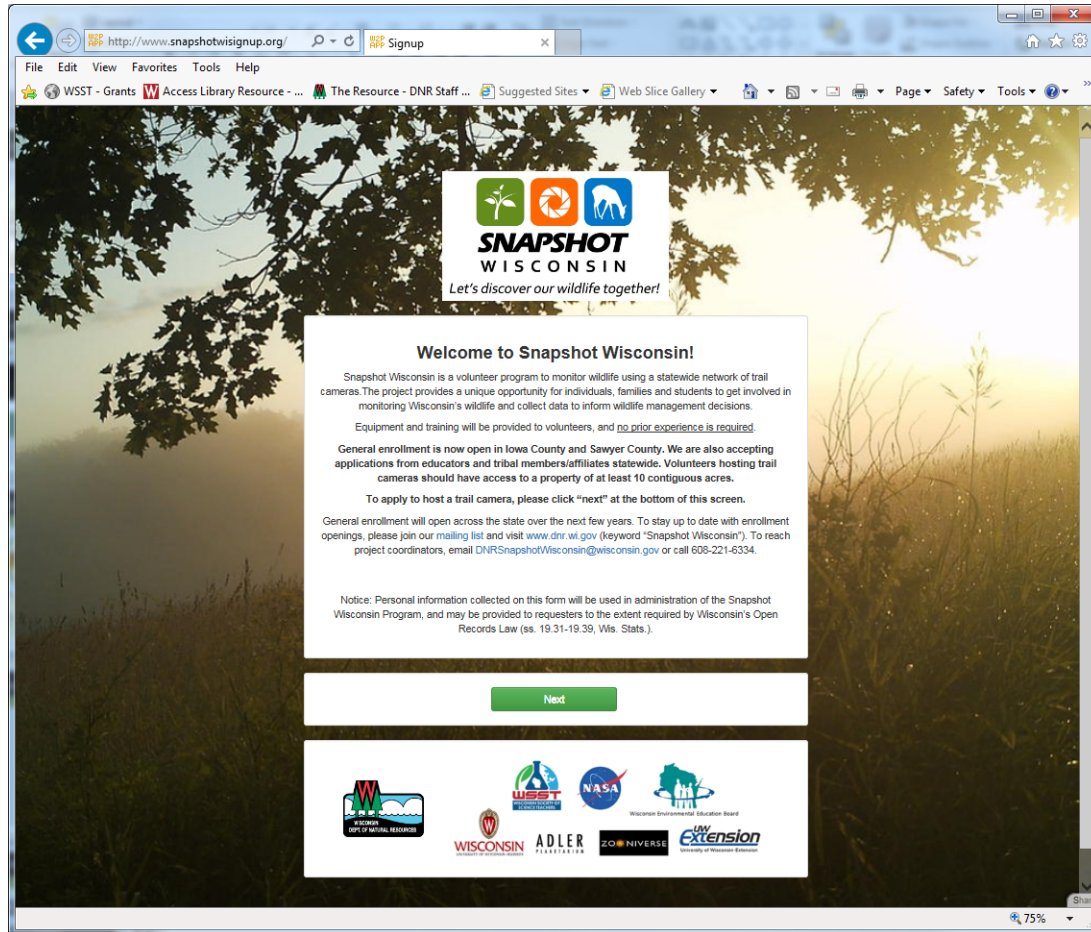


Upload & check photos



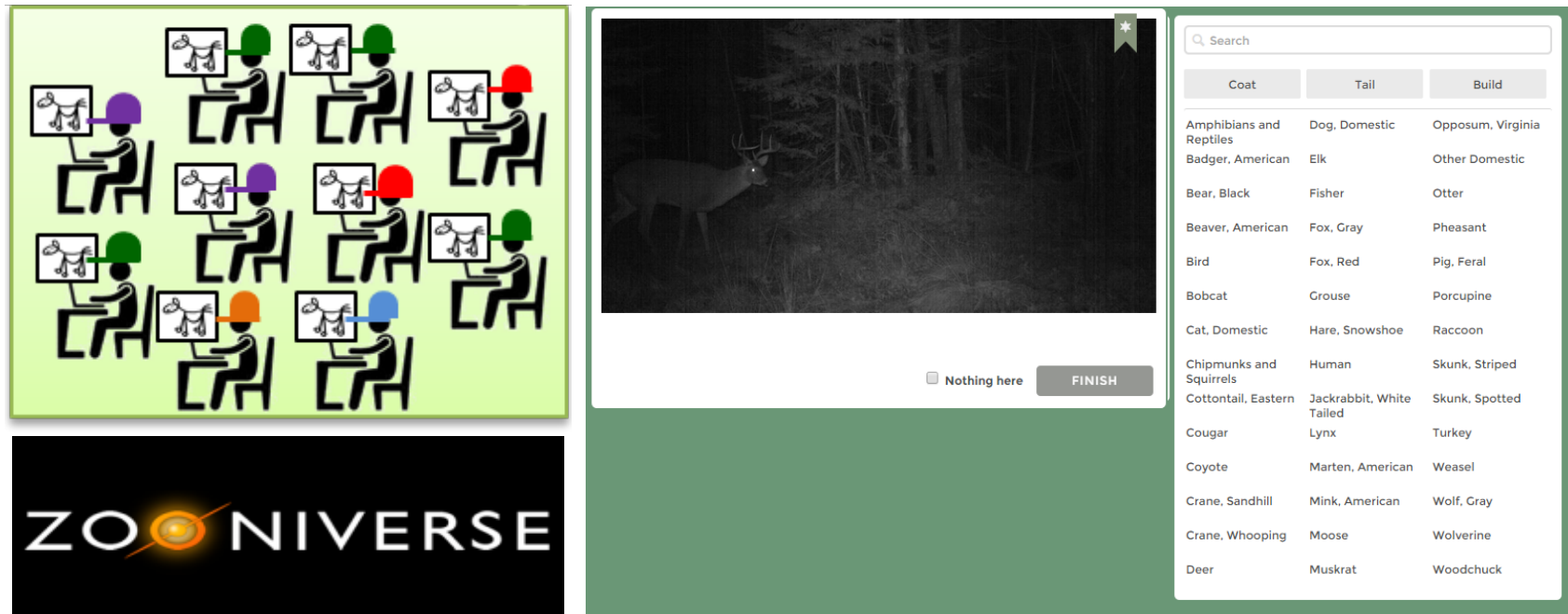
Enrolling volunteers by county

SnapshotWisignup.org



Citizen Science: Two ways to participate

2. Classify animals in photos



Laura Trouille (Adler Planetarium), many others

www.snapshotwi.org

Live Now!

Press and Media Blitz on May 17

The screenshot shows the Snapshot Wisconsin website. The browser address bar displays <https://www.zooniverse.org/projects/zooniverse/snapshot-wisconsin>. The navigation bar includes links for Projects, About, Talk, Notifications, Collect, BUILD A PROJECT, Sign in, and Register. Below this, a secondary navigation bar features icons and labels for SNAPSHOT WISCONSIN, RESEARCH, CLASSIFY, FAQ, EDUCATION, TALK, BLOG, and TEAM. The main content area has a background image of a forest with autumn foliage. A large text overlay reads: "Welcome to Snapshot Wisconsin. Help us identify animals in trail camera images." Below this text is a blue button labeled "Get started!". On the right side of the main image, there is a vertical button labeled "FIELD GUIDE". Below the main image, the section "ABOUT SNAPSHOT WISCONSIN" is displayed, followed by a paragraph: "Snapshot Wisconsin is an effort to monitor wildlife year-round across a network of volunteer managed trail cameras. Help us to identify the animals captured on camera and better understand the distribution and trends of our wildlife populations." At the bottom, there is a row of logos for partner organizations: Wisconsin Dept. of Natural Resources, Wisconsin (University of Wisconsin-Madison), UW Extension (University of Wisconsin-Extension), NASA, WSST (Wisconsin Society of Science Teachers), Adler Planetarium, and Wisconsin Environmental Education Board.

<https://www.zooniverse.org/projects/zooniverse/snapshot-wisconsin>

Projects About Talk Notifications Collect BUILD A PROJECT Sign in Register

SNAPSHOT WISCONSIN RESEARCH CLASSIFY FAQ EDUCATION TALK BLOG TEAM

Welcome to Snapshot Wisconsin. Help us identify animals in trail camera images.

[Get started!](#)

[FIELD GUIDE](#)

ABOUT SNAPSHOT WISCONSIN

Snapshot Wisconsin is an effort to monitor wildlife year-round across a network of volunteer managed trail cameras. Help us to identify the animals captured on camera and better understand the distribution and trends of our wildlife populations.

Logos: Wisconsin Dept. of Natural Resources, Wisconsin (University of Wisconsin-Madison), UW Extension (University of Wisconsin-Extension), NASA, WSST (Wisconsin Society of Science Teachers), Adler Planetarium, Wisconsin Environmental Education Board




Looks Like

Body Size

Rare/Uncommon

Amphibians and Reptiles	Fisher	Pig, Feral
Badger	Fox, Gray	Porcupine
Bear	Fox, Red	Raccoon
Beaver	Grouse	Skunk, Spotted
Other Bird	Jackrabbit	Skunk, Striped
Bobcat	Lynx	Snowshoe Hare
Cat, Domestic	Marten	Squirrels and Chipmunks
Cottontail	Mink	Turkey
Cougar	Moose	Weasel
Coyote	Muskrat	Wolf
Crane, Sandhill	Opossum	Wolverine
Crane, Whooping	Other Domestic	Woodchuck
Deer	Other Rodent	Nothing here
Dog, Domestic	Otter	Human
Elk	Pheasant	

Showing 44 of 44.  Clear filters

Done

Show the project tutorial

FIELD GUIDE

Building an online community

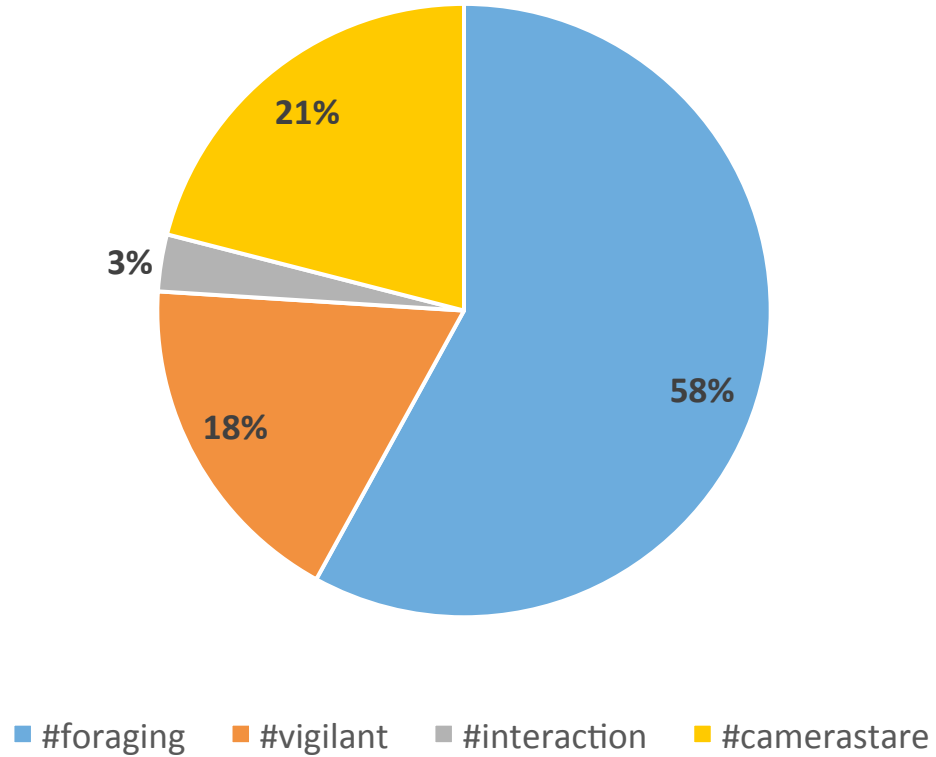
7558 comments in 4934 posts to date

Talk boards are motivational to participants, but also provide us with a wealth of information

- Qualitative data on which species are difficult for individuals to identify
- Source of opportunistic data
- Social Science Research: **Public Engagement in Science**

Christine Anhalt-Depies (Ph.D. Student), *UW-Madison*

Volunteer Hashtags



Objectives:

Education Attitudes Engagement Community Involvement Build relationships

Human/vehicle detection

Remove identifiable humans/vehicles

Current version: Color based

Next version: optical flow + segmentation + ML
(under development)

